

WATER TEST OF ADRENAL FUNCTION

SUMMARY OF PATIENTS WITH POSITIVE RESULTS IN PART 1 AND PART 2

1. Addison's disease	16
2. Pituitary disease	
a. Acromegaly	2
b. Basophilic adenoma	8
c. Rathke pouch cyst	1
d. Pituitary cachexia	1
Total	12
3. Miscellaneous adrenal disease	
a. Carcinoma of adrenal	1
b. Cushing's syndrome	1
c. Water retention (?)	1
Total	3
4. Other conditions giving positive results	
a. Disseminated lupus erythematosus	1
b. Diffuse carcinomatosis	2
c. Rheumatoid arthritis	1
d. Renal tuberculosis	1
e. Duodenal ulcer	2
f. Incorrect technic	1
Total	8
Grand total	39

CONCLUSIONS

The results of 194 consecutive water excretion tests for adrenal function in 173 patients indicate its value in the diagnosis and exclusion of adrenal insufficiency.

Only one of the 112 patients giving negative results in both parts of the test was considered to have Addison's disease. All other tests for adrenal insufficiency gave comparable results in this instance.

Adrenal insufficiency was not proved to exist in any patient by completing part 2 of the test after part 1 was negative.

False positive results were obtained in 8 patients. Chronic cachexia, duodenal ulcer, or renal disease appeared to be the explanations for the incorrect results.

REFERENCE

1. Robinson, F. V., Power, M. H., and Kepler, E. J.: Two new procedures to assist in the recognition and exclusion of Addison's disease: A preliminary report. Proc. Staff Meet., Mayo Clinic 16:577 (Sept. 10) 1941.

ERRATUM

In the article "Exstrophy of the Bladder in Twins" in the October, 1943 issue of the CLEVELAND CLINIC QUARTERLY the following error appeared on page 140, "M. T. had complete exstrophy of the bladder with an associated hypospadias," which should read, "M. T. had complete exstrophy of the bladder with an associated epispadias."



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SOVIET MEDICINE

The more we learn of Russian medicine, the greater is our respect for her medical workers. The curtain has been lifted, and novel and attractive paths are revealed for the progressive physician to follow. The appearance of a new medical journal, *American Review of Soviet Medicine*, has introduced us to many phases of Russian practice, which have stimulated our admiration.

We have admired the reaction of that nation to unprovoked attack. This reaction is also manifest in its medicine. In the course of a defensive retreat, military medicine had to be changed quickly from a peacetime basis and adapted to the tactics of war. The total capacity of all evacuation hospitals and permanent hospital trains was placed under direct control of the chief medical officer. A bottle-neck was avoided, and order was established.

In the treatment of major casualties in shock, operation was deferred up to three days if neither hemorrhage nor intracranial pressure was present. Wounded were transported before rather than after serious operation. Deferment to a skilled surgeon was preferred to early operation by one less capable. At the end of a year, 70 per cent of all casualties had been returned to active duty, truly a remarkable record under military reverses. In the campaign in Finland frostbite was considered as a spasm of the capillaries and disturbance of nutrition through damage of the neurotrophic apparatus.

As a result of early operation for nerve injuries there was greater restoration of function. The use of formalinized nerves obtained from cadavers accelerated regeneration of peripheral nerve fibers.

An antireticular cytotoxic serum has been used to prevent recurrence in cancer, check scarlet fever, control surgical and puerperal sepsis, and to treat lung abscess and osteomyelitis. The hope is expressed that the serum will provide a means of fighting the precocious senile fading of the body, of fighting for its normal longevity.

Russian medicine is making a large contribution to progress.

HOWARD DITTRICK, M.D.

THE STOMACH AFTER OPERATION

Radiologic Consideration of Types of Operation, Peptic Ulcer, and Neoplasm

FREDERIC E. TEMPLETON, M.D.

Examination of the stomach after operation is one of the most difficult and often most puzzling procedures in roentgenology. In post-operative examinations the roentgenologist deals with an inconstant situation. The types of operation are many and varied, and the results of the same operation, especially if it is performed by different surgeons, may be different in appearance. The purpose of this article is to present the normal appearance after some of the more common operations on the stomach and to describe some lesions, particularly peptic ulcer and gastric neoplasm.

Most gastric operations are performed to remove diseased tissue, to decrease gastric acidity, and to reestablish continuity of the lumen. The many and varied operations devised to obtain these effects are usually performed for peptic ulceration and neoplasm. Since these two lesions are likely to recur, most roentgenologic examinations after operation are made to detect recurrent ulcers and neoplasm. Of the two processes recurrent benign ulceration is the more common. As these recurrent ulcers usually develop about the stoma of a gastro-enterostomy, it is imperative that the roentgenologist be familiar with the different surgical procedures.

It is not my purpose to describe every operation for treatment of benign ulceration or neoplasm, for many operations are rarely used. The discussion is confined to a few popular types employed in the United States.

Many types of operation performed on the stomach may present similar appearances at roentgenologic examination. For instance, it is not always possible to tell whether at the time of a partial gastric resection the continuity of the lumen was reestablished by inserting the cut end of the stomach into the side of the jejunum or by closing the cut end and making an anastomosis between the jejunum and the nearby greater curvature of the stomach.

A. TECHNIC OF EXAMINATION

Even though the examiner is familiar with the type of operation performed, he must begin the roentgenologic examination cautiously. If the patient drinks all the barium mixture quickly, the field becomes flooded, and the examiner has trouble locating the various structures,

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particularly the stoma and the loops of intestine which lead to and away from the site of anastomosis.

The examination is best carried out on a standard filming fluoroscope (spot machine), an instrument so designed that fluoroscopic images can be recorded on films as the examination progresses.

The patient is placed in a right, slightly oblique position behind the fluoroscopic screen. He is handed a glass containing about 100 cc. of a barium cream (one-half barium and one-half water by volume) and is requested to fill his mouth with the mixture and then to swallow. If the amount of contrast medium is insufficient to coat the gastric mucosa and to enter the stoma, the patient repeats the dose until the stomach and the stoma are outlined. The flow of medium into the intestine is observed. At the beginning of the examination the barium usually passes through the efferent loop. After this loop has been identified, the patient is requested to take more of the mixture in order to increase the flow. The first few centimeters of this loop are carefully examined; for most recurrent ulcers are found in this area. As the flow of barium increases, the afferent loop fills and also must be identified; for occasionally this may be the site of an ulcer. If the two loops overlap, the patient is turned until the loops are clear of each other. Palpation helps to separate the loops. If the stomach overlaps the stoma and obscures it, the stoma may be seen by pushing the stomach upward or by rotating the patient, usually into a left oblique position.

If the two loops fill simultaneously, it is difficult to distinguish the afferent loop from the efferent. The position of the loops does not aid; for in one patient the afferent loop is medially placed, and in another the efferent. The flow of barium should be followed along the intestine in order to observe the direction of the peristaltic waves. Barium seldom moves in a retrograde manner along the afferent loop beyond the ligament of Treitz; when it does, peristalsis usually carries it back toward the stoma. Barium in the efferent loop is carried by peristalsis into the deeper portions of the intestinal tract.

After the loops are examined with the patient in the right oblique position, the patient is turned to the extreme left oblique or the left lateral position, so that the stoma is seen in profile either along the anterior or along the posterior wall of the stomach. After the stoma and the two loops of the intestine are examined, attention is directed to the stomach. If the barium passes rapidly from the stomach through the stoma, the flow may be blocked by exerting pressure over it with the left hand. The right hand is used to palpate the stomach.

If resection has not been performed and if the jejunum has been anastomosed to the stomach, an attempt is made to force barium

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through the pylorus into the duodenal bulb. When the duodenal bulb fills, it is examined for deformity and crater.

The stomach is studied with the patient standing and facing the examiner. The table is then tilted so that he lies in the supine position. The barium in the stomach flows into the fundus. If all the contrast mixture has passed from the stomach, additional barium is given through a drinking tube. After the fundus is studied, the patient is turned to the prone position, and the stomach and intestinal loops are again observed. Unless some shadow suggesting a lesion appears while the patient is still in the horizontal position, the examination is complete. Should there be such a finding, the table is tilted up, the patient given more barium, and the region examined.

As the examination proceeds, with the patient standing first in the left and then in the right anterior oblique positions, films are exposed of the stoma and of the intestine adjacent to the stoma, as well as films of any shadow suggesting a lesion. When fluoroscopy is completed, the patient is placed upon a regular grid table in the prone position with the left side slightly elevated. A 10 by 12 inch film is centered over the stomach and exposure made. A 14 by 17 inch film is also made of the entire abdomen, with the patient lying flat on his abdomen. The latter view provides excellent visualization of the intestine.

B. NORMAL APPEARANCE

The operations described are confined to three general types: (1) those without an anastomosis, but with a closed incision, such as local resection of a lesion or closure of a gastrostomy; (2) those with an anastomosis to the intestine, either with or without resection; and (3) those with an anastomosis to the esophagus.

1. Local repair. In most instances the scar from a local excision or from perforation of a lesion cannot be detected at roentgenologic examination. Much of the deformity observed after repair of a perforated ulcer in the duodenum existed before the ulcer perforated.

In some instances, however, a puckering of the mucosa of the wall of the stomach, resulting from the operation, is seen. As the scar gradually contracts, the puckering is increased. This deformity in itself is not significant. It must be recognized, however, so that it will not be mistaken for another type of lesion, particularly the scar of an ulcer. Here the history of operation is valuable in arriving at the correct interpretation.

Prevot¹ described the appearance of invaginated walls produced by repair of a perforated ulcer of the duodenal bulb. His description of the condition is that which might be expected from study of the surgical

technic. He interpreted a roentgenogram as showing apposing walls of the repaired region protruding into the lumen of the duodenum. I have not encountered such a picture and believe that it is unlikely to occur unless the patient is examined shortly after the anastomosis is made. Specimens studied several weeks or months after local excision or repair of a perforation show that the apposing walls gradually fuse and straighten out. This leaves only a flat linear scar, sometimes with puckering of the surrounding mucosa.

In my experience the defect from repair in the stomach has rarely been demonstrable at roentgenologic examination. When demonstrated, the appearance of the defect is that of shallow indentation or of slightly irregular folds. If the defect is along the greater curvature of the stomach, as is usual after closure of a gastroenterostomy stoma, puckering cannot be distinguished because of the complicated pattern of the normal folds.

2. Gastroenterostomy. a. Simple gastroenterostomy. Operations performed to treat lesions in the duodenum and lower portion of the stomach often require anastomosis between the intestine and stomach. When only anastomosis is made, the term simple gastroenterostomy is applied. Two types of operation are used. In one the second portion of the duodenum is anastomosed to the anterior wall of the gastric antrum (gastroduodenostomy); in the other the jejunum is anastomosed to the lower portion of the gastric body (gastrojejunostomy). The latter type of anastomosis is accomplished in two ways. In one the loop of jejunum close to the ligament of Treitz is brought up through the colonic mesentery and anastomosed to the lower portion of the posterior wall of the stomach (posterior gastrojejunostomy). In the other a long loop of jejunum is brought up in front of the colon and anastomosed to the lowest portion of the anterior wall of the stomach (anterior gastrojejunostomy). The loop that runs from the duodenum to the anastomosis is called the afferent loop, and the one that runs from the anastomosis toward the ileocecal valve is called the efferent loop. In an anterior gastrojejunostomy an anastomosis is often made between the dependent portion of a long afferent loop and the efferent loop (enteroenterostomy).

b. Partial resection. If the lower portion of the stomach is resected, continuity of the lumen must be reestablished by an anastomosis between the stump of the stomach and the intestine. This is done (1) by anastomosing the open end of the stomach to the open end of the duodenum (Billroth I), or to the lateral wall of the jejunum (Polya); (2) by partially closing the upper portion of the open end and anastomosing the lower end to the lateral wall of the jejunum (Hofmeister); or

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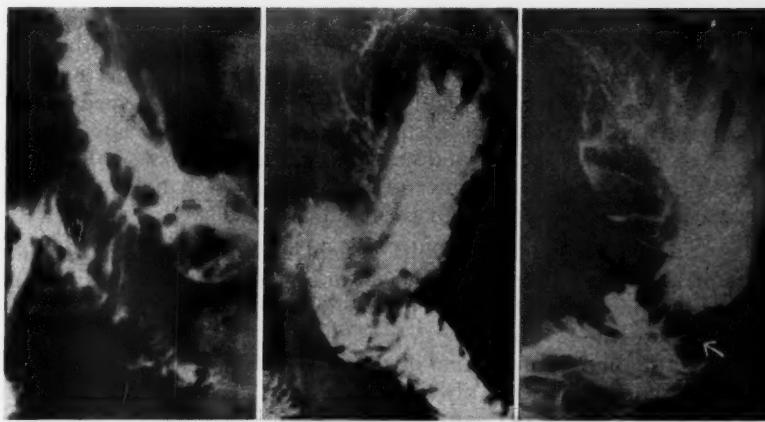


FIG. 1. Gastroenterostomies. (a) Simple gastroenterostomy. Parallel folds extending from the greater curvature of the stomach to the jejunum give the stoma a corrugated appearance. The film was made with the patient in a prone position. The right side of the patient is to the reader's left. (b) Posterior Polya anastomosis. After partial resection the lower end of the stomach was anastomosed to the side of the jejunum. (c) Hofmeister anastomosis. The lower half of the stomach was resected. The upper pole at the open end of the stomach was closed, and the lower portion anastomosed to the jejunum. The stoma is designated by arrows. Above the stoma the abrupt cessation of rugae at the site of closure of the open end of the stomach can be identified.

(3) by closing the entire open end of the stomach and anastomosing the jejunum to the lower portion of the stomach (Billroth II) (fig. 1). As in a simple gastrojejunostomy the loops of the jejunum may be brought up behind the colon to form an antecolic anastomosis. The retrocolic operation, however, is more frequently employed.

c. Roentgenologic identification of operations. The Polya, Hofmeister, and Billroth II types of anastomosis are not always distinguishable from one another at roentgenologic examination, but simple gastroenterostomy, gastroduodenostomy, and the Billroth I may be easily distinguished from other types of anastomoses. The retrocolic anastomosis is distinguished from the antecolic by the length of the afferent loop and the position of the stoma on the stomach. In the retrocolic anastomosis the afferent loop of jejunum is short and protrudes from the posterior wall. In the antecolic anastomosis the efferent loop is long and protrudes from the anterior wall of the stomach. The relationship of the intestine to the stomach is best seen when the patient stands with his left side against the screen.

d. The stoma. The examination of the anastomosis is the most important aspect of the roentgenologic examination; for it is in this

region that ulcers usually recur. The stoma may be elongated and can be seen both in profile and in frontal projection. In profile projection with the patient in the extreme left oblique or lateral position, the canal of the stoma is about one centimeter in width and is formed by the combined thicknesses of the gastric and intestinal walls. The margins near the lumen are convex and smooth. Prevot¹ describes small funnel-like outpouchings in the center of the stoma, which he interprets as recesses between the opposed gastric and intestinal walls.

In frontal projection with the patient in a right anterior, slightly oblique position, the width of the walls of the stoma varies from one to several centimeters. The stoma is seen either in axial projection (looking directly into the opening) or in cross section. In axial projection the stoma forms an irregular round opening, which may or may not contain barium. This view is not always clearly seen because the shadows of the intestine and the opposite wall of the stomach overlap. Folds radiate from the stoma, are arranged in an irregular polypoid manner about it, or are absent. When the stoma is viewed in cross section, parallel folds are sometimes seen proceeding from the stomach to the intestines. These folds are about the size of the rugae and give the stoma a corrugated appearance (fig. 1a).

In some patients the stoma is rigid and remains open, so that the barium passes rapidly from the stomach into the small intestine. In other patients the action of the stoma is rhythmic and is similar to that of the pylorus. This rhythmic action causes the barium to pass from the stomach in intermittent spurts. Schindler² believes that if the stoma possesses rhythmic activity the stomach is less apt to develop chronic inflammation than if the stoma remains open.

e. Intestinal loops adjacent to the stoma. The loops of intestine adjacent to the stoma contain the normal fine pattern of folds seen in the duodenum and jejunum in patients who have not been operated upon. Prevot¹ describes the presence of a pouch opposite the stoma, which he believes is produced by puckering of the wall. He states that the stomach is flaccid during operation, but that the walls contract and shorten the stoma as the stomach recovers tone after the operation. It is this shortening of the stoma which produces the pouch in the intestinal wall opposite the stoma.

3. Total gastrectomy (esophagojejunostomy). Total gastrectomy is usually performed for carcinoma of the upper portion of the stomach or of the entire stomach. The entire stomach is removed, the open end of the duodenum is closed, and the jejunum is anastomosed to the lower end of the esophagus.

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C. PATHOLOGIC CONDITIONS

1. Peptic ulcer. After gastroenterostomies, particularly those done for peptic ulcer, the ulcer often recurs. These ulcers usually appear within the stoma or within the loops of small intestine adjacent to the stoma. Occasionally an ulcer is found in the first portion of the duodenum after simple gastroenterostomy, or along the lesser curvature of the stomach in patients having patent gastroenterostomy stomas. Recurrent ulcers are also seen along the lesser curvature of the stomach after gastric resection as well as after simple gastroenterostomy.

Ulcers occurring in the stomach or about the stoma after operation have the same general appearance as those seen in the stomach or duodenum without operation. Ulcers which lie about a gastroenterostomy stoma are often difficult to identify. Finding these ulcers is simplified by identifying the stoma and the loops of intestine adjacent to the stoma. If this is not done and if the examiner floods the field at the beginning of the examination, he finds himself pressing here and there in an attempt to locate a collection of barium, which he terms a crater because it cannot be wiped away by palpation. Berg³ believes that, since these craters have sites of predilection, craters about an enterostomy can be identified with the same accuracy as those in the duodenal bulb, if the examiner orients himself early in the examination. After gastroduodenostomy ulcers tend to recur either within the stoma or in the wall of the intestine immediately opposite the stoma. After gastrojejunostomies most craters lie in the wall of the jejunum opposite the stoma or in the efferent loop within 3 centimeters of the stoma (fig. 2).

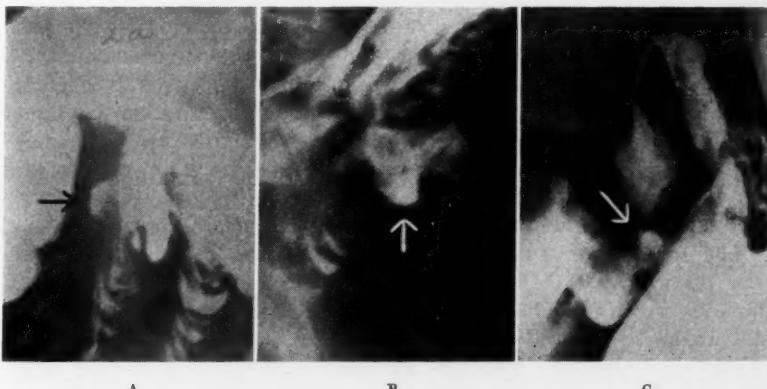


FIG. 2. Jejunal Ulcers. (a) The arrow designates an ulcer located in the efferent loop of the jejunum below the stoma of a gastroenterostomy. (b) A crater is present in the jejunal wall directly opposite the stoma of a simple gastroenterostomy. (c) The arrow indicates a crater lying adjacent to the stoma of a gastroduodenostomy in the jejunum.

When filled with barium, the craters are rounded, and neither their size nor shape is changed with palpation. They vary in diameter from a few millimeters to 2 or 3 centimeters. When viewed in profile, the base of the crater is identified by rolled margins; when seen in frontal projection, the crater is often set off from the rest of the barium by a clear halo. Radiating folds occur, and sometimes an *incisura* is produced by a scar in the wall opposite the crater. The stenosis caused by this scar may be great enough to produce obstruction. Sometimes the narrowing of the canal is increased by inflammatory edema.

The crater must be distinguished from loose collections of barium on the mucosa or in pockets. These spurious craters are easily distorted or obliterated by pressure; ordinarily they do not have the round indented bases suggesting a rolled-up margin. Also, they are not associated with radiating folds. Decrease in the size of recurring ulcers, as they heal during medical management, can be followed by serial roentgenologic examinations.

On rare occasions a crater may perforate the colon by burrowing through adhesions formed between the gastroenterostomy and the colon. This gives rise to a gastroenterocolic fistula. Existence of this fistula is best confirmed by administering a barium enema. When the barium from the enema reaches the distal half of the transverse colon, which is the usual site of the perforation, it enters the small intestine and stomach and then progresses through the remaining portion of the colon to the cecum. The gastroenterocolic fistula is difficult to detect if the barium is administered by mouth. Either a ball valvelike arrangement exists, which interferes with passage of contents from the stomach to the colon but allows passage of contents from the colon to the stomach, or the colon fills and is not distinguishable from the loops of small intestine.

2. Inflammations. Some inflammation accompanies most recurrent ulcers, particularly those in the jejunum. The inflammation is non-specific and according to the gastroscopist, Schindler,² is extremely common in the stomach anastomosed to the intestine. The criterion for identification of these postoperative inflammatory lesions of the stomach is the same as for inflammations in the stomach before operation.^{4, 5}

The appearance of the jejunum after operation is similar to that of other portions of the small intestine which are chronically inflamed. The folds are large and are usually arranged so that their long axis is at right angles to the long axis of the jejunum. This gives a corrugated appearance. Also, the folds are stiff and difficult to obliterate with palpation. Erosions, frequently present in the inflamed jejunum, are not seen at roentgenologic examination. The lumen of the intestine may be narrowed by edema. After gastroenterostomy changes are often

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A

B

FIG. 3. Jejunitis. (a) Very little barium remains in the stomach. The gastroenterostomy is designated by arrows. The folds of the jejunum are thickened and have produced a coarse, cross-hatched appearance. Edema, reddening of the mucosa, and erosions were revealed at gastroscopic examination. (b) Five years after the patient had been on rigid medical management, the folds of the jejunum appeared normal.

most pronounced in the efferent loop close to the stoma. Under a medical regimen similar to that used in the treatment of ulcer, the appearance reverts to normal (fig. 3).

3. Carcinoma. Recurrent carcinoma is not seen so frequently as recurrent ulcer of the stomach after partial resection. It is assumed that patients operated upon for gastric carcinoma either die of metastases before a recurrence produces symptoms or are not subjected to follow-up roentgenologic examination. Many clinicians believe that if recurrence is present, nothing further can be done for the patient. There is reason to believe that carcinoma appearing in a stomach several years after operation for gastric carcinoma is not always recurrent. The

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occurrence of carcinoma in stomachs operated upon for duodenal ulcer suggests that some of the so-called recurrent carcinomas are new lesions.

Carcinoma seen in the stomach after operation may spread through the walls, especially along the lesser curvature, or may remain localized at the stoma. The two types encountered are (1) the infiltrating form, in which irregular polypoid tissue with poorly defined edges replaces the normal mucosa about the stoma (fig. 4), and (2) the polypoid form, characterized by a large smooth polypoid lesion in the stomach immediately distal to the stoma. In the latter type of lesion the surface of the tumor is covered with smooth mucosa and may not be definitely recognized as malignant either by the gastroscopist or by the roentgenologist. It is possible that the polypoid arrangement of tissue may give rise to the pattern. The large size of the mass should be more suggestive of neoplasm, for surgical technic has progressed to a stage where large amounts of redundant tissue are rarely, if ever, left in situ.



FIG. 4. Carcinoma and Gastroenterostomies. Scirrhous carcinoma involves all of the stomach and has markedly involved the antrum. The carcinoma does not extend across the stoma of a gastroenterostomy to involve the jejunum.

Prevot¹ reported the occurrence of an annular carcinoma localized at the stoma. In this instance the carcinoma surrounded the stoma and appeared to lengthen the canal. The mucosal pattern within the stoma was obliterated, and the region was rigid.

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4. Disturbed physiology. No attempt has been made to describe the various manifestations of malfunction observed in the stomach and intestine after operation. There is abundant literature which describes reasons for performing either the colic anastomosis, in which the peristaltic action of the stomach and intestine proceeds in the same direction, or the isocolic anastomosis, in which the peristaltic action of the two organs proceeds in opposite directions. I have observed both types of anastomosis and have found that the barium mixture flows equally well through each type. Occasionally in a simple gastroenterostomy barium which passes through the pylorus and duodenum splits into two streams when it reaches the stoma. One stream enters the stomach, and the other passes through the efferent loop to reach the lower portion of the intestine. In a gastric resection I have seen barium fill a dilated afferent loop and remain there for a short time. In no case has barium remained in the loop for more than twelve hours. Whether the apparently abnormal directions of flow that the food may take in the stomach after operation can give symptoms has not yet been proved satisfactorily. When barium flows in these unusual directions, however, two facts are clear. The examiner must search the efferent loop carefully for evidence of a lesion. Obstructing lesions in the efferent loop may give rise to unusual pathways for the gastric contents. The duodenal bulb in a patient with a gastroenterostomy must be carefully searched when recurrent ulcer is suspected, since acid gastric juice washes the duodenal mucosa.

SUMMARY

The roentgenologic examination of the stomach after operation is admittedly difficult. A successful examination depends largely upon a good fluoroscopic technic and a familiarity with the different types of operation used in the treatment of gastric ulcer and carcinoma.

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THE NEUROSES OF WAR

LOUIS J. KARNOSH, M.D.

With certain qualifications it may be said that the neuroses of war are the neuroses of peace. Nervous disorders, so prevalent among soldiers in the last war, are again a prominent feature of the present conflict and thus attract special attention and study. A wide range of clinical conditions has been included in the term war neuroses. In the last war the very acute and dramatic neurotic patterns were called "shell shock." In the current war the more benign term "combat fatigue" has been applied to the manifestations which appear to be a direct result of war experience. Other terms such as exhaustion neurosis, concussion neurosis, fright neurosis, effort syndrome, and neurocirculatory asthenia have been found to be applicable, although some of them may be outright misnomers.

British psychiatrists, who have had an opportunity to study the problem of war neuroses at first hand over a long period of time in the course of World War II, recognize four general categories of neurotic illness in military personnel: (1) preexisting, peacetime neuroses which continue unchanged; (2) prewar neuroses which become markedly aggravated in wartime; (3) disorders of personality which are not serious handicaps or glaring defects in normal civilian life, but which are manifested in gross mental disturbance under the pressure of army routine; and (4) neuroses which occur as completely new phenomena in apparently well-adjusted individuals.

This classification makes it at once evident that the factor of predisposition is the basic element in three of the four groups, and it can be argued that 75 per cent of all the psychiatric breakdowns in military service will fall in those groups where a preexisting disposition to nervous disease furnishes the ground substance on which the war neurosis is nurtured.

The proper recognition and rejection of inductees with such a predisposition is the primary step in controlling the psychiatric casualties of war. These "martial misfits," if detected at the time of induction, fall into five general categories of handicap.

1. Mental deficiency. This defect is the cause of the elimination of the largest number of recruits and has received more consideration by examining boards in the present war than in the last. Experience with a large group of mentally retarded soldiers demonstrates not only low efficiency in general performance and slowness and stupidity in complying with clear instructions but also a low threshold to major psychoses.

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A psychosis is easily precipitated and is usually a primitive hysterical reaction with a display of infantile behavior, pseudostupor, or wild uncontrollable panic.

2. Psychopathic personality. Psychopathic emotional instability is detected through a study of social behavior. Poor adaptability, little perseverance, a tendency to evade responsibility, constant shifting from one job to another, long periods of unemployment, and an instinctive desire for excitement and shallow sensual pleasure are earmarks of personality weakness. Pressure is often brought to bear by families and friends to have the individual with a psychopathic personality inducted into military service because "the discipline will make a man of him." On the contrary, the psychopath cannot profit by experience or discipline. Punishment for infraction of rules and for disobedience of orders has no value and does little to modify or improve the behavior of the psychopathic personality. His troubles are deeply constitutional, and he is a grave liability to military authorities. Under stress his usual reactions are major hysterical outbursts, excessive alcoholism, and wandering fugues with prolonged amnesias, or intermittent episodes of ugly rebellion and sullen irritability. Projection of a sense of inadequacy upon others, with delusions of reference and persecution, is another potentiality.

3. Gross mood disorders. These reactions are not as common in the younger soldiers, but when manifested they constitute a grievous disability and usually portend a long period of mental illness. The underlying predisposition is indicated by periods of moodiness, depression, and apathy, or by episodes of increased animation and accelerated mental and motor output extending over periods of weeks or months. Persons with a history of prolonged mood swings (cyclothymia), and particularly with a family history of major moods of melancholia or mania, are likely to follow the same reaction pattern when subjected to the vicissitudes of military life. The response to stress is usually a trend toward depression and moroseness and a sudden impulsion to commit suicide and self-injury. This psychotic reaction is observed more frequently in older men, particularly those who have been uprooted from a rather stable and fixed life routine and whose vocations in civil life are remote from what they are compelled to do as a soldier.

4. Psychoneuroses. Whether psychoneuroses arise from faulty heredity, maladjustment to the problems of everyday living, subconscious repressions, or excessive anxiety, they constitute a psychosomatic weakness, which is readily exacerbated or is characterized by new features when the person is threatened with any transition from a semisheltered or fixed routine. The basic personality structure of the psychoneurotic

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is characterized by self-centeredness, overconscientiousness, and a poor capacity to perform tasks in practical life. In general, he creates an immediate impression of being tender-minded, sensitive, and timorous with a tendency toward feminine disposition.

A somewhat distinct subgroup in the psychoneurotic category is made up of the phobic individuals who are subject to obsessive ruminative states. Those who have this so-called psychasthenic neurosis are persons who are basically overrefined, excessively meticulous, and who are propelled by unreasoning fears and various compulsive rituals. Fears of commotion, crowds, open spaces and closed spaces, and a tendency to become panic-stricken easily when any situation stimulates the particular phobia distinctly disqualify them for military service. A few individuals of this group have been reported as doing well as soldiers, but they are prone to breakdown on return to civil life.

Under stress the psychoneurotic pattern is usually an anxiety tension state or a conversion hysteria. Fatigue is usually an initial symptom followed by increased sweating, slight cyanosis of the extremities, tachycardia, and eventually a conversion into some physical stigmata, which temporarily eases acute intrapsychic conflict and unconsciously serves to remove the soldier from an intolerable situation into the relatively easy environment of a hospital or rest camp. The conversion symptoms usually persist as long as they subserve their unconsciously designated function of maintaining the individual in a protected and stressless setting.

5. Prepsychotic states. This classification includes a large group of miscellaneous personality defects which are quite difficult to detect unless a careful psychiatric survey is made. In this miscellaneous group the most noteworthy misfit is the so-called schizoid personality. An ordinary superficial examination will hardly suffice to detect the weakness in this personality structure. In a general way it is suspected when the interview or study discloses a person who is inclined to be shy, emotionally colorless, and definitely weak in gregarious instincts. A history of poor social development with an inclination toward solitary pursuits and, above all, a lack of interest in the opposite sex is strongly indicative of the schizoid personality.

This predisposition is emphasized because experience with inductees of this schizoid cast in the early phase of military training reveals a high index of breakdown with complete disorganization of personality. Recognition of the predisposition is emphasized because a relatively benignant and otherwise stable person develops a psychosis with a poor prognosis and a tendency to a pernicious deterioration. From this group emerges the psychotic soldier who usually requires prolonged hospitalization in a mental institution.

NEUROSES OF WAR

Somewhat related to the schizoid personality is the young person who is oversensitive and incapable of working under authority and discipline. The diathesis to mental disease is manifested in ideas of suspicion and delusions of persecution. In short, the overproud and at the same time incompetent individual is predisposed to a paranoid type of psychosis. While it is difficult to recognize the ground substance from which these two psychiatric conditions develop, it is essential that early trends be detected and that the principle of rejection at the source be followed even when there is some doubt about such possibilities.

TRUE WAR NEUROSES

War neurosis is now designated as "combat fatigue" or "combat neurosis." The term implies that a true war neurosis is a direct reaction to war experience and that there are few or no factors of predisposition in its inception. Immediate contributing factors may include fatigue, physical or mental exhaustion, exposure to bad weather, loss of sleep, and lack of food or water. Observations indicate that the incidence of nervous breakdown is greater in rapidly trained volunteers, in fresh troops arriving at the front, in battle-tested troops after prolonged, uninterrupted camp life, and in married men over 40 years of age. The incidence rises after harrowing military operations, especially in retreating or inactive troops. Forced passivity without means of escape or retaliation appears to impose such inhibitory stress as to precipitate the greatest avalanche of acute psychic symptoms.

While these symptoms are occasionally sudden in onset, usually they have prodromata. There is fatigue, increased indulgence in alcohol or tobacco, a tendency to seclusiveness and irritability, loss of interest, and short emotional crises. The crises make their first appearance or become amplified either during periods of lull in the environment or after a terrifying experience involving great privation, danger to life and limb, or violent physical overexertion.

There are two main objective features to this acute syndrome: (1) There may be a period of violent rage reaction, which is usually followed by (2) what is commonly termed a "sham shock" or "sham death" type of collapse. In the latter phase there is immobility, violent tremor, pallor, mutism, and general collapse.

In studying these acute neurotic manifestations one can almost observe the synthesis of the neurosis, and the principle of Pavlov's conditioning elements is strongly suggested. The entire pattern of reaction can be reproduced at any time by recreating any stimulus or fraction thereof which obtained at the time of the initial shock. This fractional stimulation will induce the reactions even though the patient is aware of its

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relative insignificance. The slightest noise simulating artillery fire, a commotion outside of the hospital door suggesting the tramping of many feet, a sudden rush of high wind, the roar of an airplane motor, or any such dissociated stimulus will induce the entire syndrome over and over again.

Experiences in dreams provoke the same reaction, and therefore nightmares of a terrifying nature are a common sequence to the original experience. This fractional stimulation by minor and incidental experiences is commonly called the "alarm" or "startle" reaction.

If the neurosis has been acutely and recently synthesized or conditioned into being, it follows that early reconditioning offers a hope of recovery and improvement. On this basis the experiences in the Italian campaign have been very encouraging. The patient is quickly put to rest and treated symptomatically, but is maintained near the combat zone in a setting where the stimuli are still active so that he can be desensitized. It has been established, furthermore, that if a patient with such a neurosis is withdrawn to a distant rehabilitation area and protected by utter seclusion, reconditioning becomes progressively less possible, and the neurosis may become chronic. The number of those returned to duty is found to be in inverse ratio to the distance of the rehabilitation zone from the zone of combat.

Front line experience for the soldier is characterized by the exclusion of individuality, complete inhibition of natural instinctive fears, and complete absorption in and devotion to a common cause. Violent outbursts of a neurotic nature furnish an emotional outlet.

The prognosis of the neuroses of war, as of the neuroses of peace, depends on the age and intelligence of the soldier and on the duration and complexity of the nervous disorder. Early treatment is essential. Anxiety states offer a poorer prognosis than does hysteria or concussion exhaustion. Obsessional states, true to type, are most unfavorable.

Short periods of rest for those with prodromal symptoms often prevent a pernicious neurosis, and in military practice the aim should be to effect a quick removal of topical symptoms with less consideration for the basic disturbance. Most writers emphasize the necessity for a semi-military atmosphere and believe that new patients should be distributed amongst those who are improved or convalescent. Good food, rest suggestion, encouragement, and some form of remunerative work act as valuable incentives to recovery. Under hypnosis or in the waking state psychotherapy can be applied for the purpose of reviving the suppressed or repressed emotional incidents, thereby relieving the underlying situation of conflict.

NEUROSES OF WAR

However heroic, dramatic, or pragmatic the treatment may be, the necessity for an organized approach to the treatment of war neuroses is obvious. The task is indeed a colossal one, for the number of neurotic soldiers will be legion, and it is the duty of the medical profession to have available every device which will cure or palliate disability and reduce the postwar liabilities which a neurosis imposes upon the individual and upon the community.

STATUS ASTHMATICUS ASSOCIATED WITH OTHER ALLERGIES

Report of a Case

J. WARRICK THOMAS, M.D., and F. B. HOUSE, M.D.

Asthmatic symptoms may be divided into two types: (1) bronchial asthma, which usually responds to the routine measures for symptomatic relief, including ephedrine or epinephrine, and (2) status asthmaticus, the more severe form or shock type, which is characterized by extreme exhaustion and severe dyspnea bordering on collapse.

In the case reported severe status asthmaticus was recurrent and was complicated by sinus infections, drug allergy, and dermatitis medicamentosa due to neoarsphenamine. The case illustrates the complicated management of recurrent attacks of asthmatic bronchitis and episodes of status asthmaticus requiring heroic measures for the control of symptoms. On several occasions it was doubtful whether the patient would recover from the attacks of status asthmaticus.

CASE REPORT

History. A housewife, aged 38, was first seen at the Clinic on March 18, 1940. In May and June for twenty years she had rose fever with sneezing and rhinorrhea. In 1939 her symptoms began in March during the tree hay fever season and were associated with wheezing. The following September she had several attacks of asthma, and a month later she began to have attacks of coughing and wheezing every night. Since the onset of the nocturnal attacks she had lost five pounds and had become irritable and nervous. During the winter months she had a chronic postnasal drip. She noted that damp weather made her symptoms worse.

Aspirin and phenacetin made her wheeze, and codeine was thought to cause trouble also. She suspected that ham, cabbage, and milk caused water brash and nausea. Chocolate and eggs were also incriminated. She took ephedrine by mouth to control her asthma. The only other drug used regularly was mineral oil for a mild constipation.

One sister had a history of hay fever.

Physical Examination. The physical examination revealed an asthenic and underweight person. Her chest was symmetrical; the lungs were normal to percussion,

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with diminished breath sounds at the bases and numerous sibilant and sonorous râles. Gross dental neglect and caries were revealed on oral examination. Routine laboratory studies were within normal limits.

A diagnosis of perennial allergic rhinitis, bronchial asthma, seasonal hay fever (spring), and drug allergy was made.

After an allergy survey the patient was put on the following regimen: (1) avoidance of dust and other inhalants, (2) hyposensitization with an inhalant extract, (3) pre-seasonal grass and ragweed hyposensitization, and (4) epinephrine 1/1000 for control of symptoms.

Subsequent Course. The patient reported noticeable improvement in May, nocturnal coughing and wheezing being controlled with ephedrine. In July she began to have occasional attacks of coughing in the afternoon, and by the end of September she was having considerable asthma.

On October 5, 1940 the patient was admitted to the hospital with temperature elevation, severe coughing, and marked wheezing. A diagnosis of *status asthmaticus* was made. Helium, oxygen, aminophylline intravenously, and other emergency measures were administered to control the symptoms. By the sixteenth hospital day she had improved and was discharged.

On November 2 the patient was readmitted with severe asthma and was given emergency treatment. Sputum examination showed abnormal numbers of fusospirochetal organisms. This finding was confirmed by examination of secretion obtained by bronchoscopic aspiration, and a course of neoarsphenamine was recommended.

A 0.15 Gm. dose of neoarsphenamine was given on November 7, and a second dose of 0.30 Gm. two days later. The patient was then discharged. At our suggestion her local physician administered three more injections of 0.30 Gm., the last injection being given November 23.

She was slightly nauseated after the third injection, with some fever the next afternoon. Three days later a slight rash appeared on her arms and chest. This was not thought to be related to the injections of neoarsphenamine, and it disappeared in a week. There was no reaction to the fourth injection. The day after the fifth injection she had a temperature elevation with nausea and vomiting. Three days later the itching reappeared and was followed by an erythematous morbilliform rash without exudate or desquamation. The rash then became generalized on the trunk and extremities but did not involve the face, palms, soles, or scalp. A diagnosis of dermatitis medicamentosa from the use of neoarsphenamine was made. The only other drug taken was cough mixture with codeine, which was continued throughout the entire course of the rash. On the sixth day after the injections the eruption faded, although the pruritus remained. There was also edema of the forearm extending from the elbow to the wrist and pitting on pressure. The next week the patient began losing hair from the scalp, and at her next appointment two weeks later a "great deal" of hair had come out of the scalp without any loss from the axillae, pubis, or eyebrows.

When the patient returned in February 1941, she reported almost complete freedom from asthma for the two month interval. Although she still had some postnasal discharge, pollen hyposensitization for grass and ragweed was deferred; coseasonal treatment was to be undertaken if the symptoms increased during the season.

By the middle of March the patient had had two attacks of asthma requiring epinephrine. The next month her cough, sputum, and postnasal discharge increased. At otolaryngologic consultation irrigation of the sinuses was advised, which provided partial relief for a few days. Sulfathiazole was considered but not given.

In May she began to have mild attacks of asthma nightly, which were controlled by small amounts of epinephrine. On May 12 she was admitted to the hospital for the

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third time with asthmatic bronchitis and discharged six days later. A four week course of sulfathiazole was given, was well tolerated, and produced slight improvement. She took epinephrine regularly.

Dental consultation was requested, and many carious and infected teeth were found. A 4 plus Vincent's infection about the gums and teeth was demonstrated. This examination was repeated two years later, and the 4 plus infection was again revealed. A number of teeth were removed at the dentist's suggestion.

On May 24 hyposensitization was begun with autogenous sinus washings and a stock rhinopatogen vaccine. On June 19 the patient presented the mother plaque and typical findings of pityriasis rosea. The rash caused little inconvenience to the patient and subsided in time.

On September 8 she reported that only two severe asthmatic attacks occurred in the two months after the vaccine treatment.

On September 24 she was admitted to the hospital for the fourth time with severe asthmatic bronchitis and associated cyanosis. Upon discharge six days later she was much improved and suffered from mild wheezing only.

Because of maxillary sinusitis a left antrotomy was done to establish drainage October 27, 1941. A right antrotomy was done March 27, 1942 (sixth admission).

The symptoms of wheezing, nasal discharge, and postnasal drip continued throughout the winter. The patient was admitted to the hospital May 17, 1942 with a severe attack of asthma. The asthma continued to be poorly controlled, and exacerbations were usually associated with acute respiratory infections.

On December 30, 1943 she was admitted to the hospital for the eighth time with the same complaints, increased bronchial secretion, and probable infection as there was slight temperature elevation. She was given sulfadiazine, which was tolerated four days. Upon discharge January 3, 1944 she complained of some swelling of the ankles, which was not considered significant. She was advised to continue sulfadiazine under the direction of her local physician.

On January 8 she reported that her feet and legs were swollen to twice their normal size. There was redness of the legs and hips and erythema in the cubital fossae. Two days after medication was discontinued at our suggestion, the edema and redness of the legs had almost subsided, and the erythema was fading.

On January 10 the patient reported that she had required eight injections of epinephrine 1/1000 to relieve her asthma over a period of twenty-four hours. The swelling of the feet, presumably due to sulfadiazine, had entirely subsided. The only significant findings in the chest were consistent with bronchial asthma. She was advised to continue the epinephrine and was given supplemental vitamins, including 10 milligrams of thiamin chloride three times a day. The patient formerly was given a prescription of dilaudid, 1 gr. in a 4 ounce mixture, with instructions to take 1 teaspoonful when necessary for control of the cough. The preparation was tolerated by the patient and controlled the symptom.

TREATMENT

When a patient does not obtain relief from epinephrine in large doses and when other drugs fail to control the symptoms, more drastic measures of therapy must be considered.¹

Environmental factors. The patient should be placed in a room free of the offending allergens and should be hospitalized if the manifestations are severe enough to require multiple therapeutic measures.

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Feedings should be small but nourishing, with the lightest meal in the evening. The diet should eliminate all known food allergens.

Psychotherapy. Encouragement of the patient and the elimination of his fears aid in satisfactory treatment. Complete rest is beneficial, and visitors should be discouraged and limited to the family.

Helium and oxygen, measured in a ratio of 80 per cent to 20 per cent, is very helpful in some cases. A special apparatus may be used which leaves the patient free to talk and eat.

Ether and oil in equal parts is usually administered slowly by rectum. The average adult dose ranges from 4 to 7 ounces, while that for children from 0.5 to 2 ounces.

Aminophyllin, administered intravenously and very slowly in doses varying from 3.75 gr. to 7.5 gr., contributes to the relaxation and sense of well-being of the patient. A tolerance for the drug is frequently built up, and another form of treatment is required. Extravasation causes intense local burning, irritation, and possible ulceration. The drug may produce a reaction and must be administered cautiously.

Glucose and epinephrine, administered intravenously and very slowly, usually causes symptoms to subside partially or completely. Fifty per cent glucose is usually administered in 50 cc. doses with 0.1 cc. of epinephrine (adrenalin). Extravasation causes not only thrombosis but also an area of potential necrosis or ulceration.

Amyl nitrite is occasionally administered to relax bronchial musculature. A perle of the drug is crushed in a sponge, and the patient inhales the vapor until his face is reddened or until there is peripheral capillary dilatation.

Oxygen may be administered by catheters in the nose or by an oxygen tent, usually at the rate of 4 to 7 liters per minute. Relief of cyanosis and some general improvement may be expected. Oxygen is most beneficial when anoxemia is present.

Glucose and saline, usually in the form of 50 per cent glucose, may be used intravenously to lessen the secretion of tenacious bronchial mucus. Five to 10 per cent glucose and saline, administered intravenously in amounts of 500 to 1000 cc., will prevent dehydration in patients who are unable to take fluids by mouth.

Opiates are contraindicated in most cases as they inhibit the expectoration of mucus, frequently cause nausea and vomiting, and often produce a severe diminution of the respiratory rate. Deaths have been reported from the use of morphine by Vaughan.²

Avertin may be given in doses of 60 to 90 mg. per Kg. body weight. It is usually administered to promote rest and relaxation if the patient becomes adrenalin-fast and does not react to the usual dosage of 0.5 to

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1 cc. of epinephrine. The effect of the anesthesia can be counteracted by intravenous injections of coramine.

Bronchoscopic examination is occasionally instituted in severe cases of status asthmaticus to facilitate aeration by the removal of the mucus plugs. This may be a lifesaving measure. However, death may occur from a reaction to the local anesthesia.³

Rapid hyposensitization with the offending allergens has been tried with satisfactory results by Waldbott and Asher.⁴ It is very dangerous unless instituted under properly controlled conditions.

COMMENT

A number of factors complicated this patient's problem. She was very nervous and unstable. She was able to keep the mild attacks of asthma under control if her husband or some other member of the household was present. If she was alone, she became panicky, and the asthma was sufficiently exacerbated to require hospitalization.

A word of caution: In view of possible reactions certain specific drugs should be prescribed with caution to allergic patients, except as a last resort. By questioning the patient before prescribing a specific drug, an occasional history of reaction to the drug will be discovered. Particular reference should be made to neoarsphenamine and similar drugs.⁵ This case clearly illustrates the complicating factors that may result from sensitivity to a drug. After taking neoarsphenamine the patient was confined to bed and developed a marked exfoliative dermatitis with almost complete loss of hair of the head. In addition sulfadiazine caused a swelling of the legs and ankles.

The case further illustrates that episodes of shock may temporarily control asthmatic attacks or exacerbations. After the drug reaction the patient was free from asthma for two months. This mechanism has been frequently observed in the treatment of hay fever patients. If a constitutional reaction is experienced during the course of treatment, the results of treatment may be more satisfactory during the pollen season, and symptoms may not appear.

In the presence of pansinusitis surgery may be necessary to establish adequate drainage and usually controls the infection. However, surgical measures may not control such infections unless allergy management is instituted simultaneously.

There is some disagreement as to what constitutes a true Vincent's infection. Some workers feel that a discolored, dirty grey membrane must be present around the gums, as well as a huge number of organisms. Others believe that the consistent and continuous finding of a large number of fusospirochetal organisms in smears from the gums is suffi-

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cient evidence for a diagnosis. Since we found a large number of these organisms in the bronchoscopic aspirations, we considered that this finding with bronchitis and temperature elevation warranted the administration of neoarsphenamine.

During one hospitalization the patient was given morphine without adequate consideration by an intern. Fortunately, the patient experienced no unfavorable reaction except nausea and mild vomiting. As previously mentioned, morphine and allied preparations should not be given; if given, they should be administered with extreme caution. This patient received minute doses of dilaudid in a cough syrup, which was more satisfactory than any other method for controlling the bronchial or pharyngeal irritations which tend to aggravate the cough and at times precipitate recurrent episodes.

SUMMARY

When a mild form of asthma proceeds to status asthmaticus, heroic measures must be instituted. The patient should be hospitalized for intensive treatment.

Opiates are contraindicated; similar effects may be produced by chloral, bromides, barbituric acid derivatives, avertin, ether and oil. Drugs should always be administered with caution to asthmatic patients. In this case a constitutional reaction followed the administration of neoarsphenamine for the control of a Vincent's infection and was complicated by an exfoliative dermatitis with loss of hair.

Every effort should be made to eradicate foci of infection. In this case the necessary measures were the extraction of teeth, the treatment of a Vincent's infection of the lungs, and surgery to establish adequate drainage in a pansinusitis.

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THROMBOANGIITIS OBLITERANS IN WOMEN

Report of Two Cases

F. A. LEFEVRE, M.D., and JAMES BURNS, M.D.*

From 1934 to 1943 seventy-seven cases of thromboangiitis obliterans were diagnosed at the Cleveland Clinic. Only two of these cases occurred in women, and these were observed during the past two years. It is common knowledge that this condition is exceedingly rare in the female; the cause for this has never been determined.

The two cases discussed in this paper bring the total number of cases on record to thirty-one. In a review of the literature in 1938, Millman¹ found only twenty-two authenticated cases, to which he added the report of one case. Since that time the following cases have been reported: Atlas² described the condition in a woman 68 years old; Seidenstein³ reported a case in a 33 year old woman, which was indistinguishable from the typical syndrome in a man; Robinson⁴ reported a case associated with the menopausal syndrome; Wilensky and Collens⁵ reported two cases occurring in sisters; Hammarström⁶ discussed the occurrence of the syndrome with gangrene of the extremities and of a loop of small intestine with portal thrombosis.

Case 1—A Gentile woman, aged 32, was admitted to the Cleveland Clinic on May 5, 1942 because of ulceration of the toes and fingers. Three months prior to her admission she first noticed pain and slight swelling with some coldness and increased sensitivity in both of her feet. The pain was rather severe and came on suddenly but persisted even when she was at rest. On several occasions the calf area was quite tender, and several small, firm, tender nodules were present on the calves of both legs. One month after the onset of this condition an infection of the right third fingernail was opened and drained, and soon after this the procedure was repeated on the right little finger. Several weeks later a painful ulcerating area involving the left little toe developed, which was soon followed by a similar ulcer at the base of the left great toe (fig. 1). Pain and ulceration continued until her admission.

The past history was not significant. A thyroidectomy was performed in March 1942, and at the time of operation the patient had an active hyperthyroid condition. She had used tobacco for twelve years and smoked about twenty cigarettes per day.

The results of the physical examination were normal except for the findings in the extremities. The left small toe was found to be swollen and painful, the distal two-thirds bright blue in color, the tip ulcerated, and the toenail almost completely destroyed. There was a large irregular area of necrosis beneath the left great toe. The distal phalanx of the right middle finger was likewise swollen, dull red in color, and tender. There was an ulcer on the ulnar side of the nail fold, and the nail was almost completely separated from its bed. Further examination of the extremities revealed no areas of active phlebitis. Several firm nodules were present in the left calf but were not tender. X-ray of the left extremity revealed no evidence of arterial calcification. Routine laboratory tests were normal. The feet were moderately cold to palpation, and definite alterations in color upon change of position were noted. There was a slight delay in venous filling time. Readings with the oscillograph revealed the following results:

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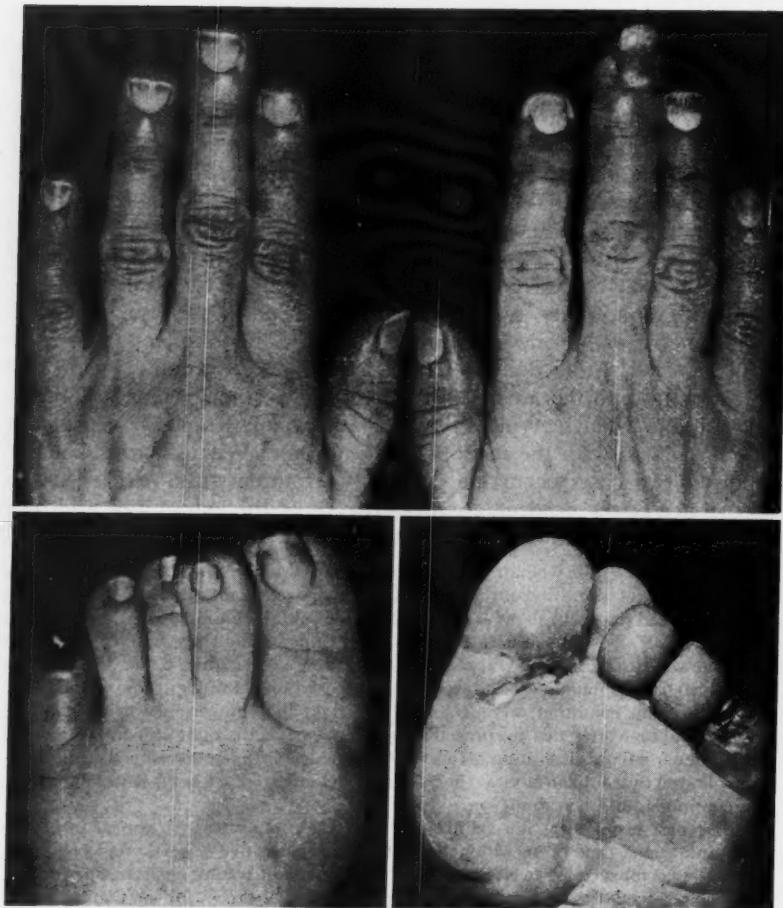


FIG. 1
OSCILLOMETRIC INDEX

	Right	Left
Calf.....	5	1
Ankle	2	$\frac{1}{2}$
PULSE		
Femoral.....	3	3
Popliteal.....	2	0
Posterior tibial.....	2	0
Dorsalis pedis.....	1	0

The clinical diagnosis was thromboangiitis obliterans.

THROMBOANGIITIS OBLITERANS

Case 2—A Gentile woman, aged 37, was admitted to the Cleveland Clinic on December 27, 1943 because of an ulcerated toe. Ten months prior to her admission she first noted pain in the right calf, which occurred especially while walking and was usually relieved by resting. This was followed by some increased coldness of the leg with color changes. In addition she noticed pain in the right second toe, even at rest. Two weeks before admission she cut the toe while trimming the nail. It did not heal readily, and soon an area of considerable tenderness and ulceration developed (fig. 2).

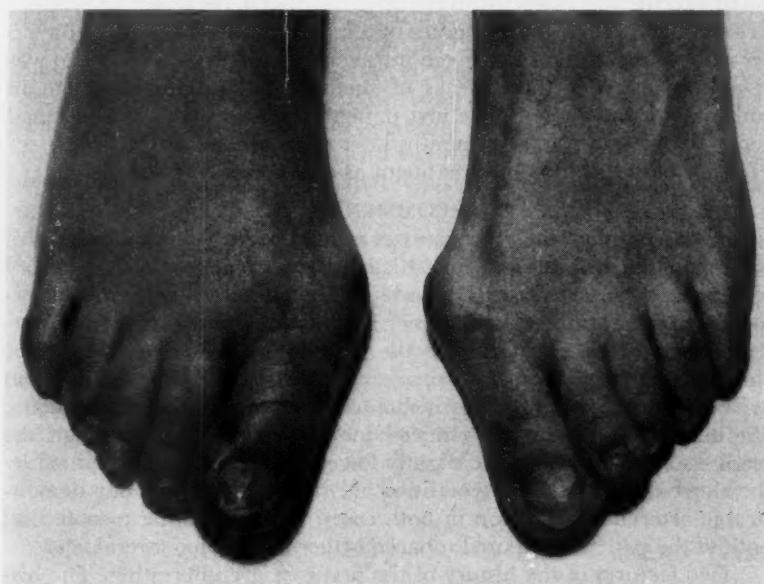


FIG. 2

The past history was essentially negative. She had had no serious illnesses nor operations. For the past ten to twelve years she had smoked ten to twenty cigarettes a day.

The results of the physical examination were normal except for the findings in the right leg. The right foot was colder than the left and color changes were rather marked, particularly on change of position. X-ray examination of the extremities revealed no evidence of arterial calcification. Routine laboratory work was normal. Oscillometric readings were as follows:

OSCILLOMETRIC INDEX

	<i>Right</i>	<i>Left</i>
Calf.....	5	5
Ankle	1½	1½
PULSE		
Femoral.....	3	3
Popliteal.....	2	2
Posterior tibial.....	1	1
Dorsalis pedis.....	0	0

Thromboangiitis obliterans was the clinical diagnosis.

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TREATMENT

The treatment⁷ for these patients was similar. Both were hospitalized immediately and placed at complete bedrest. The head of the bed was raised slightly in order to keep the extremities at the optimum level for circulation. Heat was applied by means of a thermostatically controlled heat cradle. Buerger-Allen exercises were carried out regularly. Typhoid vaccine was given intravenously, the dosage regulated to produce a rise of only two to three degrees in temperature. On alternate days 3 per cent saline solution was given intravenously. The use of tobacco was discontinued. After three weeks of therapy definite improvement in both patients was noted. The first patient returned home and resumed her smoking habit. Several months later she was readmitted with a recurrence of ulceration, and treatment as outlined was repeated.

COMMENT

In our opinion the two cases presented a true clinical picture of thromboangiitis obliterans. The diagnosis was made from the history of a progressive circulatory disturbance involving the extremities, resulting in ulceration and gangrene. Examination revealed definite evidence of reduced circulation in the extremities as indicated by color changes, change of temperature, and reduced peripheral pulsation, and in the first case by reduced oscillometric readings. The oscillometric readings were not greatly reduced in the second case, although the readings at ankle level were slightly lowered. This can be explained by the short duration of the condition. X-ray studies ruled out demonstrable arterial calcification in both cases. It is interesting to note that both of the patients had used tobacco rather heavily for several years.

Two features of the history of the first case are interesting. The history of thrombophlebitis is quite consistent with the occurrence of thromboangiitis obliterans and frequently precedes arterial involvement. This patient had hyperthyroidism preceding the onset of vascular changes; in our experience, the occurrence of hyperthyroidism and thromboangiitis obliterans is exceedingly rare.

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MEDICAL PHYSICS

(Introduction)

OTTO GLASSER, Ph.D.

Medical physics is commonly regarded as a new branch of medicine. The discovery of fundamental physical phenomena, such as the cathode rays, x-rays, radioactive substances, and neutrons, as well as successful applications of earlier discoveries in practical medicine, has fostered the impression that medical physics is an achievement of the twentieth century. That impression is not accurate. The science of physiology, for example, began with Harvey, who was the first to use systematic measurements in biological investigations and the first to attempt to correlate biological phenomena with physical laws. Fundamental knowledge of blood pressure depended on the development of suitable manometers. Many facts about the heart and circulation of blood could not have been learned without the microscope, string galvanometer, stethoscope, and roentgen rays. With the discovery of x-rays electronics entered the service of medicine. This discovery by Röntgen in 1895 and that of radium by the Curies in 1898, together with the subsequent evolution of medical radiology, vividly illustrate the close relationship of physics and medicine. Although recent discoveries and developments have led to an increasing recognition of physics as an essential part of the substructure of medicine, progress in biology and medicine has always been significantly related to advances in physics.^{1, 2, 3}

Medical physics interprets living processes by physical laws; it analyzes the effects of physical agents on living tissues. Medical physics provides information concerning the physical theories and principles that apply to various medical procedures and instruments and a working knowledge of their use. Accordingly, the activities of a biophysics department are devoted to using physical phenomena to analyze living processes, as well as to produce methods and tools helpful to the physician in his diagnostic and therapeutic work. Many centers of biophysical research have been created during the last twenty years. The late Dr. George Crile was one of the first to recognize the importance of this research and to be interested in its development.

The utilization of physical principals has led to the development of methods for measuring radium dosages in "gamma roentgens," radioactive phosphorus for the treatment of myelogenous or lymphatic leukemias, artificial radioactive isotopes for tracer studies within the organism, the ultracentrifuge or the Tiselius electrophoretic apparatus for studies of protein fractions, the Wetzel grid for the analysis of factors

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influencing the growth of children, methods defining the limitations of tests for defective color vision, the electroencephalograph, the electrocardiograph, and the audiometer.

The average physician, however, still looks askance at the attempts of experimental or mathematical physicists to adapt their working methods to his everyday medical procedures. He finds it difficult to understand the value of physics in medicine and therefore does not assign the same importance to physics that he does to chemistry. One reason for this attitude is inherent in the literature on medical physics. Research reports on the subject are scattered throughout the literature of physics, chemistry, physiology, and medicine. At present no medium easily accessible to physicians and surgeons exists for publication of articles that deal exclusively with medical physics. In recent years attempts have been made to concentrate such publications in special journals or sections of journals and in books on biophysics, but these have usually dealt with limited aspects of medical physics. There has been a definite need for a collection of widely diverse information on medical physics in a form useful both to practitioners of medicine and to biophysicists.

The field of radiology was one of the first to be interpreted from the biophysical viewpoint.^{4, 5} More recently the whole field of medical physics has been approached in the same manner. Through the combined efforts of 250 collaborators the principal applications of physics to medicine have been assembled in one text.⁶ The material presented in this book shows that medical physics has become an essential part of the substructure of medicine, and that it performs a function similar to that of medical chemistry.

In subsequent issues we shall endeavor to acquaint the general practitioner with specific and practical applications of physics to medicine.

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ERRATUM

In the article "Secondary Closure of Wounds" in the January, 1944 issue of the CLEVELAND CLINIC QUARTERLY the following error appeared on page 1, "The rate of healing of wounds varies greatly and does not appear to be related either to gross infection or to vitamin C deficiency," which should read, "The rate of healing of wounds varies greatly and appears to be related to other factors besides gross infection and vitamin C deficiency."